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Phonon Densities of States of C15 Rare-earth Iron Compounds at Elevated Temperatures

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Nuclear resonant inelastic x-ray scattering measurements were performed on YFe_2, ErFe2, and $TbFe_2$ at elevated temperatures. The spectra were converted into phonon densities of states. A large decrease of the average phonon energy was observed with increasing temperature, consistent with a Grüneisen parameter of about four. This value is in good agreement with measurements of the thermal expansion, bulk modulus, and heat capacity from the literature. A preliminary Born-von Karman analysis of the inter-atomic force constants is presented.